Curriculum Book (Published on website for students)

<table>
<tr><td colspan="2">Course Title: Design of Experiments</td><td colspan="2">Course Number: 408285</td><td>Course Code:</td></tr>
<tr><td colspan="2">Year: Final Year</td><td colspan="3">Semester: 1</td></tr>
<tr><td colspan="2">Designation of Course</td><td colspan="3">Professional Core</td></tr>
<tr><td colspan="2">Teaching Scheme: 4 Hours/Week</td><td colspan="3">Tutorial: 2 Hours / week</td></tr>
<tr><td rowspan="3">Course Assessment Methods</td><td rowspan="2">Direct methods</td><td>In-semester Examination: 30 Marks</td><td colspan="2">End Semester Examination: 70 Marks</td></tr>
<tr><td></td><td colspan="2">Term Work</td></tr>
<tr><td>Indirect Methods</td><td>Assignments, Tests</td><td colspan="2">Seminars, Quiz, Q&A session,
Group Discussion</td></tr>
<tr><td>Prerequisites</td><td colspan="4">Introduction to Print Processes, Print Statistics</td></tr>
<tr><td colspan="5">Course Objectives</td></tr>
<tr><td>1</td><td colspan="4">Understand the basic principles of Experimental Design and Problem Definition</td></tr>
<tr><td>2</td><td colspan="4">Analyze Types of Data - Discrete and Continuous, Sampling and sampling distribution.</td></tr>
<tr><td>3</td><td colspan="4">Formulate Hypothesis and Errors</td></tr>
<tr><td>4</td><td colspan="4">Estimate factors and levels for a defined experiment</td></tr>
<tr><td>5</td><td colspan="4">Implement various Experimental Design</td></tr>
<tr><td>6</td><td colspan="4">Analyze Experimental Design with Graphical tools</td></tr>
<tr><td colspan="5">Course Outcomes</td></tr>
<tr><td>C405.1</td><td colspan="4">Understand Basics of Experiential Design and Factors</td></tr>
<tr><td>C405.2</td><td colspan="4">Distinguish the types of data and apply Sampling Plan for data analysis</td></tr>
<tr><td>C405.3</td><td colspan="4">Set and Test the Hypothesis for a given problem and identify Errors in an Experiment</td></tr>
<tr><td>C405.4</td><td colspan="4">Evaluate Factors and Levels for Experimental Design</td></tr>
<tr><td>C405.5</td><td colspan="4">Apply Design of Experiment and ANOVA</td></tr>
<tr><td>C405.6</td><td colspan="4">Evaluate Experimental Design with Graphical tools such as Histograms, Charts and Cause-Effect diagrams</td></tr>
<tr><td colspan="5">Course Contents</td></tr>
<tr><td>Unit-I</td><td colspan="4">Introduction to Research Methodology and Introduction to Experimental Design [6 hours]</td></tr>
<tr><td></td><td colspan="4">Fundamentals of Research: Meaning, Objectives, Motivation, Utility, Understanding language of Research: Concept, Construct, Definition, Variables, Research Process, Problem Identification. Basic principles of DOE: Replication, Randomization and Blocking, Advantages & applications of DOE, Common terminologies used in DOE; Guidelines for Designing Experiments: problem definition, selection of operating parameters & levels, selection of response</td></tr>
</table>

	variables, experimental design, performing experiments, Statistical analysis of data, Conclusions
	Practical/Tutorial
	Conduction of Design of a full factorial experiment at 2-levels of screen mesh and squeeze hardness with appropriate sampling plan. Analyses of 2-levels of screen mesh and squeeze hardness for the response print density with Main Effects and Interaction Plots by matrix method only.
Unit-II	**Basic Statistical Concepts and comparison of entities [6 hours]**
	Understanding Basic concepts: mean, median, variance, run, factors, responses, replicate, noise, experimental error, Types of Data - Discrete and Continuous, Sampling and sampling distribution, Introduction to Variation, Sigma levels, Measurement System Evaluation (MSE)
	Practical/Tutorial Analyses of 2-levels of screen mesh and squeeze hardness for the response dot gain with Main Effects and Interaction Plots by matrix method only. Performing Measurement System Evaluation of a Densitometer.
Unit-III	**Hypothesis Testing [8 hours]**
	Tests of hypothesis: Null and Alternative Hypothesis, Type I and Type II error, p-value in hypothesis testing, t- test, F-test, chi-square test, sample size, Confidence intervals
	Practical/Tutorial Setting and Testing of Hypothesis with calculations of p-value, null & alternative hypothesis for print density and dot gain without any statistical software. Calculation of Sum of squares, F-value, p-value, R-sq of ANOVA Table for print density without any statistical software.
Unit-IV	**Analysis of Variance [8 hours]**

	Factor, levels, treatment, experimental unit, types of experimental designs, one way ANOVA and two way ANOVA, sum of squares, degrees of freedom, test statistics, correlation, covariance, Normality test
	Practical/Tutorial Calculation of Sum of squares, F-value, p-value, R-sq of ANOVA for dot gain without any statistical software. Designing an experiment with 2 replicates of screen ruling, ink viscosity and dot structure of any printing process for the response print density and dot gain by analyzing Main Effect, Interaction, ANOVA and Lack-of-fit test in statistical software.
Unit- V	**Factorial Designs [8 hours]**
	Introduction to factorial designs, 2 level factorial designs, 2^k factorial designs, Fractional factorial designs, General full factorial design using open source statistical softwares
	Practical/Tutorial
	Identifying the optimized run for print density and dot gain from Response Optimization with the factors such as screen ruling, ink viscosity and dot structure in statistical software.
Unit-VI	**Quality Planning Tools [6 hours]**
	Histogram, Run chart, Pareto chart, Cause and Effect diagram, Symmetry plot, Multi-Variate chart, Scatter plot, Box plot, Line plot and Probability Distribution plot, Control Chart, Response Optimizer, Process Capability
	Practical/Tutorial

Text Books	**Author**	**Title of Book**	**Publication**
T1	M.D. Morris, (2011), ,	Design of Experiments - An introduction based on linear models	CRC Press.
T2	G. Casella, (2008),	Statistical Design,	Springer.
T3	Kothari, C.R.,	Research Methodology, Methods and Techniques,	2nd Edition, New Age International

			Publications
Reference Books			
R1	Douglas C. Montgomery, (2001), Design and Analysis of Experiments, 5th Edition, John Wiley and Sons Inc		
R2	D. D. Joshi (1987), Linear Estimation and Design of Experiments. Wiley Eastern		
R3	G. M. Smith, (2004), Statistical Process Control and Quality Improvement. 5th Edition, Prentice Hall, NJ, USA		
R4	H. Sahai and M.I. Ageel, (2001), The analysis of variance-Fixed, random and mixed models, Springer.		
R5	David Silverman, (2000), Interpreting Qualitative Data, 5th Edition, Sage Publishing.		
Self-Learning Facilities, Web Resources, Research papers for reference	Assignments		
Contents beyond Syllabus	Regression Modelling, Multivariate Analysis		
Additional Experiments			
Bridging Courses	Workshop on Regression Modeling to be arranged, Workshop on Minitab software can be arranged		
Tutorials			
Presentations			

Curriculum Book (Published on website for students)

Course Title: Technology of Gravure		**Course Number: 408283**	**Course Code: 408284**
Year: Final Year		**Semester: 1**	
Designation of Course		Professional Core	
Teaching Scheme: 3 Hours/Week		**Practicals :** 2 Hours / week	
Course Assessment Methods	**Direct methods**	In-semester Examination: 30 Marks	End Semester Examination: 70 Marks
			Term Work
	Indirect Methods	Assignments, Tests	Seminars, Q&A session, Group Discussion
Prerequisites	Basic Printing Techniques, Ink Technology		
Course Objectives			
1	Attain basic and technical know-how of the Gravure subject.		
2	Understand the pre-press requirement for gravure.		
3	Understand the impact of gravure process variables on printability.		
4	Understand standardization of a gravure press.		
5	Understand the vital role of gravure in flexible packaging.		
6	Learn the modern trends in gravure.		
Course Outcomes			
C405.1	Compare between different gravure cylinder making methods.		
C405.2	Explain different gravure image carriers and analyze the effect of cell geometry on gravure print quality.		
C405.3	Explain different gravure image carriers and analyze the effect of cell geometry on gravure print quality.		
C405.4	Explain various types of inking systems, drying systems and compute doctor blade assembly used on a gravure press.		
C405.5	Explain various types of pressurization methods and modern trends in impression system.		
C405.6	Justify the importance of web handling and compute web transport roller and balancing of rollers on a gravure press.		
Course Contents			
Unit-I	**Gravure Image Carrier** **[6 hours]**		
	Basic Methods of Gravure Image Production, Chemical Etching, Electronic Engraving and Direct and Indirect Laser Engraving, Processing Steps, Comparison between Etching and Engraving, Making of etched and engraved cylinder with reference to ink and substrate.		
	Practical/Tutorial		
	Study of Gravure Machine principles.		
Unit-II	**Surface Preparation for Gravure** **[6 hours]**		
	Cylinder bases, Functions of Copper, Chrome and Zinc, Variables in Plating, Process Steps from Press to Press, Base copper technique, Ballard Shell, Corrections in Copper and Chrome, Comparison between soft copper and hard copper, Measurement and Testing, Surface finish of cylinder such as roughness measurement, consistency and quality, Gravure Proofing.		
	Practical/Tutorial		

	Gravure cylinder mounting and de-mounting, Analysis of Gravure Cell Structures
Unit-III	**Gravure Process** **[6 hours]**
	Introduction, Rotogravure Press Configurations, Unit construction, Press Sections, Sheet-fed Gravure, Ink Transfer in Sheet fed Gravure, Hybrid Process, Gravure Products and Applications, Types of Inks used for Gravure
	Practical/Tutorial
	To print a single-color job with etched cylinder on a given substrate, To print a single-color job with varying speed.
Unit-IV	**Inking and Drying System for Gravure** **[6 hours]**
	Types of Inking system, Viscosity Control, Viscosity and Gravure print quality, Doctor Blade and purpose, Doctor blade types, Doctor Blade assembly, Doctor blade loading, Need and Types of Dryers used on gravure press, efficiency of dryers, Basic fundamentals of air inlet volume and velocity in a dryer, relationship of exhaust air volume with inlet air volume, LEL monitoring and recirculation of hot solvent laden air, Flammability of solvents, OSHA (Occupational Safety and Health Association) Standards, Incineration process (Regenerative thermal oxidation) or Solvent Recovery Plant
	Practical/Tutorial
	To print a single-color job with engraved cylinder with varying viscosity on a given substrate.
Unit- V	**Impression System** **[6 hours]**
	Functions of Impression system, types of elastomers used, types of impression system, factors governing pressure, factors governing pressure, impression loading, specifications for impression rollers, testing properties, Electrostatic Assist, need for ESA, Working of ESA, Benefits of ESA, Effect of ESA on Print Quality, Impression shore hardness and gravure print quality.
	Practical/Tutorial
	To evaluate effect of ESA Voltage on absorbent substrate, To evaluate effect of ESA Voltage on non-absorbent substrate.
Unit-VI	**Web Handling** **[6 hours]**
	Splicing Mechanism, Web aligner, Surface treatment, Web tension, Tension Zones, Register Control-Manual and Automatic, Web transport roller, Purpose of idle rollers, Requirements of idler rollers, Roller balancing, Electronic Line Shaft.
	Practical/Tutorial
	To evaluate effect of Air Gap distance on print quality,

Text Books	**Author**	**Title of Book**	**Publication**
T1	W. R. Durrant, (1989),	Printing-A Guide to Systems and their Uses	Heinemann Professional Publishing.
T2	P. Laden, (1997),	Chemistry and Technology of Water based Inks	Blackie Academic, London.
T3	E. A. Apps, (1958),	Printing Ink Technology,	Leonard Hill Ltd.

Reference Books	
R1	Gravure Process and Technology, (2003), Gravure Education Foundation and Gravure Association of America.
R2	Harry B. Smith, (1994), Modern Gravure Technology, Pira International.
R3	H. Kipphan, (2001), Handbook of Print Media, ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg.
R4	Ronald E. Todd, (1994), Printing Inks: Formulation Principles, Manufacture and Quality Control, Pira International.
Self-Learning Facilities, Web Resources, Research papers for reference	Assignments
Contents beyond Syllabus	New Up gradation & Application for Gravure Printed Products with End Application.
Additional Experiments	
Bridging Courses	
Tutorials	
Presentations	End Application of Gravure Printed Products (Automotive Industry)

Pune Vidyarthi Griha's
College of Engineering and Technology, Pune

Curriculum Book
Academic Year 2019 -2020

Course Title: Advertising & Multimedia		**Course Number: 408281A**	
Year:B.E		**Semester: I**	
Type of Course	Professional Core		
Teaching Scheme: 03 Hrs/Week		**Laboratories:**2 Hrs/Week	
Course Assessment Method Examples	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination: 70 Marks
		Term-work : 25marks	Practical :25marks
	Indirect Methods	Assignments, Presentations, MCQs	Seminars, Quiz, Q&A session, Group Discussion
Course Prerequisites	Introduction to Printing Processes, Digital Printing Technology		
Course Objectives	**Assessment Method Used**		
1	Describe the basic concepts and principles in mass communication technology and significance of different marketing tools		
2	To understand types of advertising, their applications, attributes		
3	Understand the significance of market research, media research, campaign planning		
4	. To understand branding and brand equity		
5	To get an insight of integrated media campaigning.		
6	To develop a complete understanding for promotion of product, service, or idea and use the concept of theme building and USP		
Course Outcomes Interpret Apply Employ Use Practice Schedule Sketch Prepare Modify Predict Extrapolate Manage Choose Solve			
C401A.1 :	Significance of Print advertising in details for successful promotion of commodity		
C401A.2 :	Analyze the market/audience based on surveys, research		
C401A.3:	Understanding various advertising media, its reach, its prerequisites and results		
C401A.4 :	Create campaign planning for integrated media concept and importance of branding		
C401A.5 :	Understand the advertising agency structure, and concept of construction of advertisement		
C401A.6 :	Develop, create concept, USP for commodity promotion		

Course Contents	
Unit-I	**Introduction**
	What is an idea, how to develop idea, the core idea, the research process -Finalize the core concept – Mood board – Styling – Referencing – look and feel - Presentation - Pitching – How to develop an idea into an narrative form. Introduction to Advertising as a tool of communication Role of Advertising in marketing mix.Types of Advertising – Product advertising, Service advertising, Institutional Advertising, Public Relations advertising, Public Service Advertising, Financial Advertising
Unit-II	**Market & Advertising**
	Research – Types / Scope of research, Market Research – Market surveys – Audience surveys Market segmentation Targeting, Advertising Research, Advertising evaluation, ADGMAR approach,Types of Advertising evaluation
Unit-III	**Media & Product**
	Types of media, Media Vehicles, Functions, Audience surveys, TRP, NRS, ABC, Product research meaning & scope, Analyzing & Testing of products, Important of product research, Limits, Product Positioning
Unit-IV	**Campaign Planning and Brand Building**
	Three phases of campaign, Campaign planning – these identification, why to advertise in terms of campaign, Creativity & psychology in advertising, Introduction – What is Brand, Brand communication Purpose for advertising Brands, Why do people need brands, Brand building Process – Role of an advertising agency in building brands – The brand story. Brand equity – personality, positioning
Unit- V	**Construction of advertisement**
	Introduction to – Text – Typography - Fonts – Style – Layout, Color theory, Styling – Layout Tables - Graphics – Illustration – Image manipulation - Restoration – infographics – Print media – Online media – Outdoor media - TVC. Visualization, copy writing, Headlines, slogan, Types of copy, Requisites of an effective layout, Advertising agency structure, Responsibilities of personnel, Advertising Budget, methods of budgeting, Budgeting process
Unit-VI	**Latest trends in advertising and Multimedia advertising**

	Latest trends in advertising-Digital advertising, Using mobile, QR codes, Co-branding strategy, Content marketing Multimedia, File formats, Non-linear programs, Collaboration of different media such as video skills, audio & animation, Authoring, Animated advertising Case study
Practical	**Any Eight**
	1. Campaign planning for selected product/ service/ idea
	2. Design a full-page newspaper advertisement
	3. Design a half page newspaper advertisement
	4. Design a full-page magazine advertisement
	5. Design a half page magazine advertisement
	6. Design an outdoor advertisement for hoarding
	7. Design an outdoor advertisement for banner
	8. Design multimedia advertisement in Flash for cable TV (running strip)
	9. Design multimedia advertisement in Flash for internet viewing

Text Books	**Author**	**Title of Book**	**Publication & Edition**
R1	Chunawalla, Sethia	Foundations of advertising theory & practice,	Himalaya Publications
R2	Batra, Myers, Aaker	Advertising Management	Prentice Hall
R3	Richard E. Meyer	Handbook of Multimedia	Cambridge Publications

Self-Learning Material (OCW, Handouts, Web Recourses, Research papers etc.)	- Web Recourses : https://www.campaignindia.in/ - https://brandfolder.com/blog/9-branding-books/ - http://www.journalofadvertisingresearch.com/
Contents beyond Syllabus	Understanding psychology of buyer
	Market study of buying behaviour
Additional Experiments (If any)	Design an ad campaign for newly launched Gym
Bridging Courses	-

Assignments	
1	Discuss types of advertising with example (one product with different ads)
2	Explain the difference between the audience and buyer
3	Explain the need of outdoor advertising
Tutorials	
Presentations	a. Advertising media
	b. Advertising design
	c. Campaign planning
	d. Market research study
	e. Importance of color in advertising
	f. Branding and advertising
	g. Case study of any multimedia advertising

Course Name: C401A Year of Study:2019-20

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C401A.1	-	-	2	-	-	1	-	-	-	2	2	2
C401A.2	-	1	-	3	1	3	-	1	-	-	-	2
C401A.3	-	-	-	-	-	3	-	1	-	-	2	2
C401A.4	-	-	1	2	-	3	2	-	1	-	2	2
C401A.5	-	1	2	2	1	2	3	1	-	3	1	2
C401A.6	-	-	1	1	2	3	3	2	1	-	1	2

CO	PSO1	PSO2
C401A.1	1	2
C401A.2	1	3
C401A.3	2	1
C401A.4	2	3
C401A.5	1	1
C401A.6	1	2

Pune Vidyarthi Griha's

College of Engineering and Technology, Pune

Curriculum Book

Academic Year: 2019-20

Course Title: Packaging Materials and Processes		**Course Number: 408288 A (2015 Course)**	
Year: BE		**Semester: I**	
Type of Course	Elective		
Teaching Scheme: 3 Hrs/Week		**Laboratories:** N/A	
Course Assessment Method Examples	**Direct methods**	In Semester Examination: 30 Marks	End Semester Examination: 70 Marks
	Indirect Methods	Presentations	Q&A session, Brainstorming
Course Prerequisites	Basic Printing Techniques, Material Science		
Course Objectives	**Assessment Method Used**		
1	Know the basic requirements of Packaging.		
2	Understand the role of substrates used in packaging.		
3	Understand various types of converting processes used in packaging.		
4	Understand various types of packaging techniques used for food applications.		
5	Understand the wrapping techniques for various products.		
6	Learn various tests carried out on packaging substrates.		
Course Outcomes			
CO408A.1	Understand the role of plastics in packaging.		
CO408A.2	Understand the role of paper, board, wood, glass and metals in packaging.		
CO408A.3	Understand various extrusion, lamination, coating and varnishing techniques used in packaging.		
CO408A.4	Understand bag-in-box, retort and aseptic techniques for the improvement of shelf life for a given product.		
CO408A.5	Understand various wrapping, closure and pouching methods for a product.		
CO408A.6	Understand various tests carried out for the identification of substrates.		
Course Contents			
Unit-I	**Plastics in Packaging**		

	Basic requirements of Packaging, Raw materials for Packaging such as Cellophane, Polyethylene, Polypropylene, PET A, PET G, Aluminum Foil, PVC, PS, Biodegradable and Eco friendly packaging-Advantages and Limitations, Food grade plastics, Recycling of plastics, Properties and applications of the packaging materials.		
Unit-II	**Paper, Board and Other Materials in Packaging**		
	Paper-Types, Manufacturing, Properties, Specialty papers for Packaging, Folding board cartons and coated cartons; Corrugated Boards-Types, Applications, Specifications; Types, Properties and applications for Wood, Glass Metals and Textile.		
Unit-III	**Converting Processes**		
	Extrusion and Co-extrusion technology, Advantages, Limitations, Polymer compatibility for co-extrusion process, applications of co-extrusion, coating techniques, lamination technique such as Dry, Wet, Hot-melt, Thermal and Extrusion, Metallization, Varnishing.		
Unit-IV	**Packaging Techniques**		
	Bag-in-Box, Retort Packaging, Requirements for Retort, Aseptic Technology, Aseptic packaging for food products in PET Bottles, Lami-tubes, Processing and Advantages.		
Unit- V	**Wrapping Techniques and Closures**		
	Shrink wrapping, Process, Stretch wrapping, Process, Comparison between Stretch and Shrink wrapping, Closures, Purpose, Types of Closures, Applications, Flexible Pouches such as Stand-up pouches, two-sided seal, three-sided seal pouches, Pouching machines, FFS machines.		
Unit-VI	**Material Testing**		
	Mechanical – Tensile, Tear burst, impact; barrier properties, WVTR test, Adhesion test, Optical – Gloss, haze and clarity; Chemical Resistance test – solvents and chemicals, Migration test, Plastic material identification test, solvent retention; Hardness and corrosion test for metals; Clarity and brittleness test for glass.		
Text Books	**Author**	**Title of Book**	**Publication & Edition**
T1	A. S. Athayle	Plastics in Packaging	Tata McGraw-Hill Publication
T2	A. S. Athayle	Plastics in Flexible Packaging	Multi-Tech Publishing
Reference Books			

R1	S. Natarajan. M. Govindarajan, and B. Kumar	Fundamental of Packaging Technology	PHI, New Delhi
R2	Aaron L. Brody, Kenneth S. Marsh	Encyclopedia of Packaging Technology	A Wiley-Interscience Publication, 2nd Edition
R3	M. Mahadevian, R. V. Gowramma	Food Packaging Materials	Tata Mc Graw Hill Publication
R4	Walter Soroka	Fundamentals of Packaging Technology	Institute of Packaging Professionals, 4rth Edition
R5	J. A. Cairns, C. R. Oswin	Packaging for Climatic Protection	Newness-Butterworth

Self-Learning Material (OCW, Handouts, Web Resources, Research papers etc.)	Sharon, K. (2003). The Growing Shrink Label. Package Printing, 50(9), 55.
	Dumitrascu, N., Balau, T., Tasca, M., Popa, G. (2000). Corona discharge treatment of the plastified PVC Films obtained by chemical grafting. Materials Chemistry and Physics, 65(2000), 339-344.
	Comparative Analysis of Polymer Roll-Fed Shrink-Label Substrates, Retrieved October 20, 2014 from www.kpfilms.com/en/news/pdfs/.../Roll_sleeve_white_paper_2.8.13.pdf
	Genuario, L. (2004). Shrink Films. Label and Narrow Web. Retrieved from http://www.labelandnarrowweb.com/issues/2004-05/view_features/shrink-films-45653/
	Velho, J., & Santos, N. F. (2010, March). Surface Topography of Coated Papers: From the Evaluation Process to the Quality Improvement. In Materials Science Forum (Vol. 636, pp. 977-984).
	Pazur, A.S. (1983). Processing and formulation on gel levels in flexible PVC extrusions. Journal of vinyl technology, 5 (3), 126-131.
	Attension. (n.d.). Surface free energy-Background, calculation and examples by using contact angle measurements [White Paper]. Retrieved from: www.attension.com/attensionan5-surfacfreeenergy-250810.pdf
Contents beyond Syllabus	Effect of surface energy of substrate on print quality.
	Effect of Substrate surface structure on dot fidelity.
	Effect of substrate electrical properties on ink transfer.
Additional Experiments (If any)	NIL
Bridging Courses	NIL

Assignments	NIL
Tutorials	NIL
Presentations	Substrates used in flexible packaging.
	Packaging methods and deterioration factors for non-food and food products.

Pune Vidyarthi Griha's

College of Engineering and Technology, Pune

Curriculum Book

Academic Year: 2019-20

Course Title: Web Offset and Web Handling		**Course Number: 408283 (2015 Course)**	
Year: BE		**Semester: I**	
Type of Course	Professional Core		
Teaching Scheme: 3 Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Method Examples	**Direct methods**	In Semester Examination: 30 Marks	End Semester Examination: 70 Marks
		Term-work: 25 Marks	Practical: 25 Marks
	Indirect Methods	Presentations	Q&A session, Brainstorming
Course Prerequisites	Introduction to Printing Processes, Material Science, Sheet-fed Offset Printing Technology		
Course Objectives			
1	Understand reel handling and cylinder construction for web presses		
2	Understand concept of ink drying on heatset presses and folding mechanisms		
3	Understand web tension measurement and control		
4	Understand auto registration systems and auxiliary equipment used in web presses		
5	Understand printing standards for web offset processes		
6	Learn press troubleshooting and initiatives for environment friendly printing		
Course Outcomes			
C403.1	Identify web configurations and describe reel handling methods		
C403.2	Compare different dryers used and solve troubleshooting of ink drying		
C403.3	Examine factors affecting web tension		
C403.4	Evaluate print registration solutions		
C403.5	Utilize and analyze print attributes TVI, grey balance etc.		
C403.6	Solve troubleshooting of print results of web offset and utilize green initiatives in printing press		
Course Contents			
Unit-I	**Web Press Configuration and Drive concepts**		

	Configurations of Web presses, Paper logistics, reel stands, reel handling, reel to web processing, splice preparation, clamp truck transport, and automatic splicers. Plates used for web presses, metal backed low gap blanket technology, packing calculation in web offset, Drive concepts in web offset machine, mechanical shaft, shaft less drives in printing units
Unit-II	**Dryers, Chillers and Folders**
	Dryers & chill rolls, regeneration thermal oxidizers used on heat set presses, temperature settings of dryers and chillers as per ink coverage and substrate used, Ink behavior in coldest and heat set presses, IR dryer and UV dryer in web offset, Folders used for commercial publication, newspaper industry, continuous stationery, folding techniques, folder maintenance on web offset.
Unit-III	**Dynamic behavior of paper web**
	Effect of transport velocity and surrounding air on web transport, web instability problems in the press such as wrinkling and fluttering, Web tension control, load cells, web handling, factors affecting tension-press related tension and paper related tension, modulus of elasticity of paper, web tension profile and shrinkage profile after dryers.
Unit-IV	**Auto-registration control and Auxiliary Equipment**
	Registration control- auto registration control used on web presses, closed loop systems for register control, Auxiliary equipment used on web offset- remoisturisers unit, anti-static devices, temperature-controlled oscillators, Angle bars, turner bars
Unit- V	**Understanding Print capability of a web machine**
	Understanding various test elements to understand behaviour of inking, dampening, printing pressures, Test elements such as grey balance, color gamut, tone value increase, register. Understanding ISO 12647-3 for cold set newspaper, Wan IFRA standards for newspaper printing, Measurement of basic quality checks for paper, inks and other consumables.

Unit-VI	Web offset troubleshooting and Green Initiatives in Printing
	Web Offset troubleshooting, press troubles, infeed, dryers, chillers, folders, paper and ink problems, Deinking procedures used for web offset printed papers, use of recycled papers, using certified resources such as Forest Stewardship council (FSC) or Sustainable Forestry Initiative (SFI), Energy saving in presses, minimization of harmful chemicals in presses.

Practicals
To understand ink limit (contrast and ink density) for maplitho paper
To understand ink limit (contrast and ink density) for art gloss paper
Understanding press standardization – plate and blanket settings procedures
Understanding press standardization – inking and dampening settings procedures
Understanding press standardization – feeder settings procedures
To print multi-color job (first 2 colors of 4 colors)
To print multi-color job (next 2 colors of 4 colors)
To measure quality checks consumables for web offset substrate, inks, fount etc.
To carry out print analysis of a newspaper printed job and commercial heat set printed job and evaluate print quality using various test elements.
Study of Sheet fed and Web offset Press working using Simulator softwares- SHOTS from Sinapse

Text Books	Author	Title of Book	Publication & Edition
T1	Daniel G. Wilson	Web Offset Press Operating	Printing Industries of America Staff, 5th Edition, GATFPress, USA
T2	C. S. Mishra	Technology of Offset Printing	Anupam Prakashan, India, 1st Edition
Reference Books			
R1	W. R. Durrant	Web Control	North Wood publication 1st Edition
R2	H. Kipphan	Handbook of Print Media	1st Edition, Springer - Verlag Berlin Heidelberg, Germany
R3	Tim Claypole and Nigel Wells	Best Practice Tool Box, Web Offset Champion Group	Welsh Centre for Printing and Coating, Swansea University

R4	Wan Ifra	Newprint and News Inks Guide	Word Association of Newspapers and News Publishers
Self-Learning Material (OCW, Handouts, Web Resources, Research papers etc.)	Web Offset Printing Company, Understanding Coldset and Heatset Offset Printing, http://www.weboffsetprint.com/coldset-vs-heatset-offset-printing.html		
	System-based highest performance, quality and availability_ELS		
	WAN-IFRA., (2010), Dryer Technology: Heat-set Vs. UV Curing		
	Jim Raymont., (2011), Curing of Printing Inks by UV, RadTech Report		
	Eltex., Top Class Remoistening		
	Flint Group., Web Offset Heatset Troubleshooting Guide		
Contents beyond Syllabus	Safety Precautions in Offset Lab		
	Fingerprinting of a Web Press		
Additional Experiments (If any)	NIL		
Bridging Courses	Use of statistical tools in print optimization		
	Analysis of Web prints		
Assignments	NIL		
Tutorials	NIL		
Presentations	Types of Folders		
	Splicing Operation		